

IN THE CLAIMS:

Please amend Claims 1, 2, 5, 11, 12, 23, 24, 27, 35, 38, 39, 44, 45, 49, 52 and 53 and add Claims 63 and 64 as follows. A marked-up copy of Claims 1, 2, 5, 11, 12, 23, 24, 27, 35, 38, 39, 44, 45, 49, 52 and 53 showing the changes made thereto, is attached. Note that all the claims currently pending in this application, including those not presently amended, have been reproduced below for the Examiner's convenience.

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1. (Five Times Amended) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system having plural surfaces including a surface of a unit onto a portion of which a titanium oxide film absorbing ultraviolet light is applied, the portion being removed from an optical axis of the illumination system.

2. (Five Times Amended) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system including a plurality of optical units, at least one of said plurality of optical units having a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, the portion being removed from an optical axis of the illumination system.

3. (Four Times Amended) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system including a plurality of optical elements and a barrel for supporting said plurality of optical elements, said barrel having an inside surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied.

4. (Twice Amended) An illuminator according to claims 1, 2 or 3 wherein the luminous flux comprises ultraviolet light, and said titanium oxide film prevents a contaminant from adhering to and contaminating the portion of the surface of the unit onto which said titanium oxide film is applied due to a photoconductive function caused by absorption of the ultraviolet light.

5. (Twice Amended) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system having plural surfaces including a surface onto a portion of which a titanium oxide film absorbing ultraviolet light is applied, wherein a unit of said illumination system comprises at least a diaphragm.

6. (Amended) An illuminator according to either claim 1 or 2, wherein said unit comprises at least a lens.

7. (Unamended) An illuminator according to claim 2, wherein said optical unit comprises a diffraction optical lens using a diffraction optical element.

8. (Unamended) An illuminator according to claim 2, wherein said optical unit comprises a mirror.

9. (Twice Amended) An illuminator according to claim 2, wherein said titanium oxide film is applied onto a portion of the surface of said optical unit at which light passes therethrough.

10. (Twice Amended) An illuminator according to claims 1, 2, or 3, wherein said titanium oxide film has a thickness ranging from 10 nm to 100 nm.

11. (Five Times Amended) An exposure apparatus for exposing a wafer with a pattern formed on a mask, said exposure apparatus comprising:

an illumination system for illuminating the mask with light from a light source, said illumination system having plural surfaces including a surface of a unit onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, the portion being removed from an optical axis of the illumination system.

12. (Five Times Amended) An exposure apparatus for exposing a wafer with a pattern formed on a mask, said exposure apparatus comprising:

an illumination system for illuminating the mask with light from a light source,

said illuminating system having a plurality of optical units, at least one of said plurality of optical units having a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, the portion being removed from an optical axis of the illumination system.

13. (Four Times Amended) An exposure apparatus for exposing a wafer with a pattern formed on a mask, said exposure apparatus comprising:

an illuminating system for illuminating the mask with light from a light source,  
said illuminating system including a plurality of optical elements and a barrel for supporting said plurality of optical elements,

said barrel having an inside surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied.

14. (Twice Amended) An exposure apparatus according to claims 11, 12, or 13, wherein the luminous flux comprises ultraviolet light, and said titanium oxide film prevents a contaminant from adhering to and contaminating the portion of the surface of the unit onto which said titanium oxide film is applied due to a photoconductive function caused by absorption of the ultraviolet light.

15. (Amended) An exposure apparatus according to claim 11, wherein said illumination system comprises at least one of a diaphragm, a shutter, and a lens barrel.

16. (Amended) An exposure apparatus according to claim 12, wherein said optical unit comprises at least a lens.

17. (Unamended) An exposure apparatus according to claim 12, wherein said optical unit comprises a diffraction optical lens using a diffraction optical element.

18. (Unamended) An exposure apparatus according to claim 12, wherein said optical unit comprises a mirror.

19. (Amended) An exposure apparatus according to claim 12, wherein said titanium oxide film is applied onto the surface of said optical unit at which light passes through.

20. (Twice Amended) An exposure apparatus according to claims 11, 12, or 13, wherein exposure is performed while the pattern on the mask is scanned synchronously with the wafer.

21. (Twice Amended) An exposure apparatus according to claims 11, 12, or 13, wherein said titanium oxide film has a thickness ranging from 10 nm to 100 nm.

22. (Four Times Amended) A method for fabricating a device by using an exposure apparatus according to any one of claims 11 to 13 and claims 15-19, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using said exposure apparatus;

and

developing the exposed wafer.

23. (Five Times Amended) A projection aligner for illuminating a pattern formed on a mask with a luminous flux and projecting the pattern onto a wafer, said projection aligner comprising:

an illumination system through which the luminous flux is passed; and

a projection system for projecting the pattern onto the wafer,

wherein said illumination system and said projection system have plural surfaces including at least one surface of a unit onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, the portion being removed from an optical axis of the illumination system.

24. (Five Times Amended) A projection aligner for illuminating a pattern formed on a mask with a luminous flux and projecting the pattern onto the wafer, said projection aligner comprising:

an illumination system through which the luminous flux is passed, said illumination system including a plurality of optical units; and

a projection system for projecting the pattern onto the wafer, said projection system including a plurality of optical units,

wherein at least one of said plurality of optical units of at least one of said illumination system and said projection system has a surface onto at least a portion of which a

titanium oxide film absorbing ultraviolet light is applied, the portion being removed from an optical axis of the illumination system.

25. (Four Times Amended) A projection aligner for illuminating a pattern formed on a mask with a luminous flux and projecting the pattern onto a wafer, said projection aligner comprising:

an illumination system through which the luminous flux is passed, said illumination system including a plurality of optical elements and a barrel for supporting said plurality of optical elements; and

a projection system for projecting the pattern onto the wafer, said projection optical system including a plurality of optical elements and a barrel for supporting the plurality of optical elements,

wherein at least one of the barrels of said illumination system and said projection system has an inside surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied.

26. (Twice Amended) A protection aligner according to claims 23, 24, or 25, wherein the luminous flux comprises ultraviolet light, and said titanium oxide film prevents a contaminant from adhering to and contaminating the portion of the surface of the unit onto which said titanium oxide film is applied due to a photoconductive function caused by absorption of said ultraviolet light.

27. (Twice Amended) A projection aligner for illuminating a pattern formed on a mask with a luminous flux and projecting the pattern onto a wafer, said projection aligner comprising:

an illumination system through which the luminous flux is passed; and

a projection system for projecting the pattern onto the wafer,

wherein said illumination system and said projection system have plural surfaces including at least one surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, and

wherein a unit of at least one of said illumination system and said projection system comprises at least a diaphragm.

28. (Amended) A projection aligner according to claim 24, wherein said optical unit comprises at least a lens.

29. (Unamended) A projection aligner according to claim 24, wherein said optical unit comprises a diffraction optical lens using a diffraction optical element.

30. (Unamended) A projection aligner according to claim 24, wherein said optical unit comprises a mirror.

31. (Amended) A projection aligner according to claim 24, wherein said titanium oxide film is applied onto a portion of the surface of said optical unit at which light passes therethrough.



32. (Twice Amended) A projection aligner according to claims 23, 24, or 25, wherein illumination and projection are performed while the mask and the wafer are synchronously scanned at a velocity ratio based on imaging magnification of said projection optical system.

33. (Twice Amended) A projection aligner according to claims 23, 24, or 25, wherein said titanium oxide film has a thickness ranging from 10 nm to 100 nm.

34. (Three Times Amended) A method for fabricating a device, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using the projection aligner according to any one of claims 23 to 25 and claims 27 to 31; and  
developing the exposed wafer.

35. (Amended) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system having plural surfaces including a surface onto a portion of which a titanium oxide film absorbing ultraviolet light is applied,

wherein a unit of said illumination system comprises at least a shutter.

36. (Unamended) An illuminator according to claim 1, wherein said unit comprises at least a lens barrel.

37. (Unamended) An illuminator according to either claim 1 or 2, wherein said unit comprises at least a mirror.

38. (Amended) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system having plural surfaces including a surface onto a portion of which a titanium oxide film absorbing ultraviolet light is applied,

wherein a unit of said illumination system comprises at least a prism.

39. (Amended) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system having plural surfaces including a surface onto a portion of which a titanium oxide film absorbing ultraviolet light is applied,

wherein a unit of said illumination system comprises at least a filter.

40. (Unamended) An illuminator according to either claim 1 or 2, wherein said unit comprises at least a diffuser.

41. (Unamended) An illuminator according to either claim 1 or 2, wherein said unit comprises at least a diffraction optical element.

42. (Unamended) An illuminator according to either claim 1 or 2, wherein said unit comprises at least an optical integrator.

43. (Unamended) An exposure apparatus according to claim 12, wherein said optical unit comprises at least a mirror.

44. (Amended) An exposure apparatus for exposing a wafer with a pattern formed on a mask, said exposure apparatus comprising:

an illumination system for illuminating the mask with light from a light source,

said illuminating system having a plurality of optical units, at least one of said plurality of optical units having a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied,

wherein said optical unit comprises at least a prism.

45. (Amended) An exposure apparatus for exposing a wafer with a pattern formed on a mask, said exposure apparatus comprising:

an illumination system for illuminating the mask with light from a light source,

said illuminating system having a plurality of optical units, at least one of said plurality of optical units having a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied,

wherein said optical unit comprises at least a filter.

46. (Unamended) An exposure apparatus according to claim 12, wherein said optical unit comprises at least a diffuser.

47. (Unamended) An exposure apparatus according to claim 12, wherein said optical unit comprises at least a diffraction optical element.

48. (Unamended) An exposure apparatus according to claim 12, wherein said optical unit comprises at least an optical integrator.

49. (Amended) A projection aligner for illuminating a pattern formed on a mask with a luminous flux and projecting the pattern onto a wafer, said projection aligner comprising:

an illumination system through which the luminous flux is passed; and

a projection system for projecting the pattern onto the wafer,

wherein said illumination system and said projection system have plural surfaces including at least one surface of a unit onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, and

wherein said unit comprises at least a shutter.

50. (Unamended) A projection aligner according to claim 23, wherein said unit comprises at least a lens barrel.

51. (Unamended) A projection aligner according to claim 24, wherein said optical unit comprises at least a mirror.

52. (Twice Amended) A projection aligner for illuminating a pattern formed on a mask with a luminous flux and projecting the pattern onto the wafer, said projection aligner comprising:

an illumination system through which the luminous flux is passed, said illumination system including a plurality of optical units; and

a projection system for projecting the pattern onto the wafer, said projection system including a plurality of optical units,

wherein at least one of said plurality of optical units of at least one of said illumination system and said projection system has a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, and

wherein said optical unit comprises at least a prism.

53. (Twice Amended) A projection aligner for illuminating a pattern formed on a mask with a luminous flux and projecting the pattern onto the wafer, said projection aligner comprising:

an illumination system through which the luminous flux is passed, said illumination system including a plurality of optical units; and

a projection system for projecting the pattern onto the wafer, said projection system including a plurality of optical units,

wherein at least one of said plurality of optical units of at least one of said illumination system and said projection system has a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied, and

wherein said optical unit comprises at least a prism.

54. (Unamended) A projection aligner according to claim 24, wherein said optical unit comprises at least a diffuser.

55. (Unamended) A projection aligner according to claim 24, wherein said optical unit comprises at least a diffraction optical element.

56. (Unamended) A projection aligner according to claim 24, wherein said optical unit comprises at least an optical integrator.

57. (Unamended) A method for fabricating a device by using an exposure apparatus according to claim 14, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using said exposure apparatus;  
and

developing the exposed wafer.

58. (Unamended) A method for fabricating a device by using an exposure apparatus according to claim 20, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using said exposure apparatus;  
and  
developing the exposed wafer.

59. (Unamended) A method for fabricating a device by using an exposure apparatus according to claim 21, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using said exposure apparatus;  
and  
developing the exposed wafer.

60. (Unamended) A method for fabricating a device, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using the projection aligner according to claim 26; and  
developing the exposed wafer.

61. (Unamended) A method for fabricating a device, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using the projection aligner according to claim 32; and  
developing the exposed wafer.

62. (Unamended) A method for fabricating a device, said method comprising the steps of:

exposing a wafer with a pattern of a mask by using the projection aligner according to claim 33; and  
developing the exposed wafer.

--63. (New) An illuminator for illuminating an object with an luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system including a plurality of optical units, at least one of said plurality of optical units having a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied,

wherein a unit of said system comprises at least a prism.

64. (New) An illuminator for illuminating an object with a luminous flux emitted from a light source, said illuminator comprising:

an illumination system through which the luminous flux is projected onto the object, said illumination system including a plurality of optical units, at least one of said plurality of optical units having a surface onto at least a portion of which a titanium oxide film absorbing ultraviolet light is applied,

wherein a unit of said system comprises at least a filter.--